# Q Fever

*Coxiella Burnetii*
(Also Known as Query Fever)

**DISEASE REPORTABLE WITHIN 24 HOURS OF DIAGNOSIS**

Per N.J.A.C. 8:57, healthcare providers and administrators shall report by mail or by electronic reporting within 24 hours of diagnosis, confirmed cases of Q fever to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made. A directory of local health departments in New Jersey is available at http://www.state.nj.us/health/lh/directory/lhdselectcounty.shtml.

If the health officer is unavailable, the healthcare provider or administrator shall make the report to the Department by telephone to 609.588.7500, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to 609.392.2020 during all other days and hours.

CDS
Communicable Disease Service

NEW JERSEY DEPARTMENT of HEALTH and SENIOR SERVICES

**June 2008**


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# 1 THE DISEASE AND ITS EPIDEMIOLOGY

## A. Etiologic Agent

Q fever (QF) is caused by the gram-negative bacteria, *Coxiella burnetii*. It is extremely infectious for humans; a single viable organism can cause an infection. Organisms are excreted in milk, urine, and feces of infected animals and, most important, high numbers of organisms are shed in placental tissues and amniotic fluids. The organisms are resistant to heat, drying, and many common disinfectants; thus, the bacteria may survive in the environment for an extended period of time.

## B. Clinical Description and Laboratory Confirmation

Only about one half of all people infected with *C. burnetii* show signs of clinical illness. Most acute cases of QF begin with sudden onset of one or more of the following: high fever (up to 105°F), severe headache, general malaise, myalgia, confusion, sore throat, chills, sweats, nonproductive cough, nausea, vomiting, diarrhea, abdominal pain, and chest pain. Fever usually lasts for one to two weeks. Thirty percent to 50% of patients with a symptomatic infection will develop pneumonia. Additionally, most patients have abnormal liver function tests and some will develop hepatitis. In general, most patients will recover to good health within several months without any treatment. Only 1% to 2% of people with acute QF die of the disease.

Chronic QF, characterized by infection that persists for more than six months, is uncommon but is a much more serious disease causing significant mortality, reaching 65%. Patients who have had acute Q fever may develop the chronic form as soon as one year or as long as 20 years after initial infection. A serious complication of chronic QF is endocarditis. Most patients who develop chronic infection have preexisting valvular heart disease or history of vascular graft.

Routine laboratory tests may show thrombocytopenia. Laboratory diagnosis is made by demonstration of the presence of antibodies to *C. burnetii* antigens using indirect immunofluorescence assay (IFA) methods. Organisms can also be identified in the tissues using immunohistochemical staining (IHC) or DNA detection methods.

## C. Reservoirs

*C. burnetii* has been identified in arthropods, fish, birds, rodents, marsupials, and livestock. Cattle, sheep, and goats are the most common animal reservoirs of *C. burnetii*. A variety of other animals such as horses, camels, water buffalo, cats, rabbits, dogs, wild animals (bandicoots and many species of feral rodents), birds (pigeons, ducks, geese, turkeys, and several other species of wild birds), and ticks are natural reservoirs of *C. burnetii*. Infected animals do not usually develop clinical disease, although abortion in goats and sheep has been linked to this infection. Most ruminants are seropositive if tested, but finding positive animals does not equate to shedding or to an infectious disease risk.

## D. Modes of Transmission

Infections of humans usually occur by inhalation of contaminated barnyard dust and aerosols originating from dried placental material, birth fluid, and excreta of animals in establishments processing infected animals or their by-products and in necropsy rooms. Transmission can occur through direct contact with infected animals and other contaminated materials such as wool, fertilizer, and laundry. Ingestion of contaminated raw milk, exposure to infected parturient cats, and skinning infected wild rabbits are also modes of Q fever transmission to humans. Direct transmission by blood or marrow transfusion has been reported. Person-to-person spread and transmission through tick bites are rare.

## E. Incubation Period

The incubation period of QF depends on the number of organisms that initially infect the patient. Most patients become ill within two to three weeks after exposure.

## F. Period of Communicability or Infectious Period

Person-to-person transmission is rare; however, contaminated clothing may be a source of infection.

## G. Epidemiology

The QF is a zoonotic disease of worldwide distribution. Humans are accidental hosts. In the United States outbreaks in humans have resulted mainly from occupational exposure involving veterinarians, meat processing plant workers, sheep and dairy workers, livestock farmers, and researchers at facilities housing sheep. Fewer than 120 cases per year are reported in the United States. Cases are infrequent in New Jersey. Most human cases in the United States are sporadic rather than outbreak-associated.

## H. Bioterrorism Potential

*C. burnetii* is a highly infectious agent that is rather resistant to heat and drying. It can become airborne and inhaled by humans. A single *C. burnetii* organism may cause disease in a susceptible person. This agent could be developed for use in biological warfare and is considered a potential terrorist threat. If acquired and properly disseminated, *C. burnetti*

could cause a serious public health challenge in terms of ability to limit the numbers of casualties and control other repercussions from such an attack.

# 2 CASE DEFINITION

## A. New Jersey Department of Health and Senior Services (NJDHSS) Case Definition

### 1. Clinical Description

Acute infection: A febrile illness (up to 105°F) usually accompanied by rigors, myalgia, malaise, and retrobulbar headache. Fatigue, night sweats, dyspnea, confusion, nausea, diarrhea, abdominal pain, vomiting, non-productive cough, and chest pain have also been reported. Severe disease can include acute hepatitis, atypical pneumonia with abnormal radiograph, and meningoencephalitis. Pregnant women are at risk for fetal death and abortion. Clinical laboratory findings may include elevated liver enzyme levels, leukocytosis, and thrombocytopenia. Asymptomatic infections may also occur.

Chronic infection: Infection that persists for more than six months. Potentially fatal endocarditis may evolve months to years after acute infection, particularly in persons with underlying valvular disease. Infections of aneurysms and vascular prostheses have been reported. Immunocompromised individuals are particularly susceptible. Rare cases of chronic hepatitis without endocarditis, osteomyelitis, osteoarthritis, and pneumonitis have been described.

### 2. Laboratory Criteria for Diagnosis

Laboratory diagnosis is made by demonstration of the presence of antibodies to *C. burnetii* antigens using indirect immunoflourescent assay (IFA), or enzyme-linked immunosorbent assay (ELISA) methods. Organisms can also be identified in the tissues using immunohistochemical (ICH) staining, DNA detection methods by polymerase chain reaction (PCR), or electron microscopy. Recovery of the organism from blood is diagnostic but poses a hazard to laboratory workers.

*C. burnetii* exists in two antigenic phases called phase I and phase II. In acute cases of Q fever (QF), the level of antibodies to phase II antigens is usually higher than the level of antibodies to phase I antigens, often by several orders of magnitude, and generally is first detected during the second week of illness. In chronic QF, the reverse situation is true. Antibodies to phase I antigens of *C. burnetii* generally require longer to appear and indicate continued exposure to the bacteria. Thus, high levels of antibody to phase I in later specimens in combination with constant or falling levels of phase II antibodies and other signs of inflammatory disease suggest chronic QF. Antibodies to phase I and II antigens have been known to persist for months or years after initial infection.

IgM-specific antibody tests are not strongly supported for use in serodiagnosis of acute disease, as the response may not be specific for the agent (resulting in false positives) and the

IgM response may be persistent. For acute testing, CDC uses in-house IFA IgG testing (cutoff of > 1:128), preferring simultaneous testing of paired specimens, and does not use IgM results for routine diagnostic testing.

Serologic test results must be interpreted with caution, because baseline antibodies acquired as a result of historical exposure to QF may exist, especially in rural and farming areas. Healthy asymptomatic individuals may have IgG phase II titers of 1:128 or below and would not be considered case-patients.

## 3. Case Classification

**ACUTE Q FEVER CONFIRMED**
A clinically compatible case AND

Fourfold or greater change in IgG-specific antibody titer to *C. burnetii* phase II antigen by IFA between paired serum specimens ideally taken three to six weeks apart; OR

Detection of *C. burnetii* DNA in a clinical specimen via amplification of a specific target by PCR assay; OR

Demonstration of *C. burnetii* antigen in a clinical specimen by IHC; OR

Isolation of *C. burnetii* from a clinical specimen by culture (**NOTE:** hazard to laboratory workers).

**PROBABLE**
A person with clinically compatible criteria for acute disease, who does not meet any of the laboratory criteria for acute Q fever but has a single IFA IgG titer of 1:128 or greater.

**POSSIBLE**
Not used.

**CHRONIC Q FEVER CONFIRMED**
Newly recognized, culture-negative endocarditis, particularly in a patient with previous valvulopathy or compromised immune system, suspected infection of a vascular aneurysm or vascular prosthesis, or chronic hepatitis in the absence of other known etiology AND

Serological evidence of IgG antibody to *C. burnetii* IFA phase I IgG antigen titer of 1:800 or greater (while phase II IgG titer will be elevated as well; phase I titer is higher than the phase II titer); OR

Detection of *C. burnetii* DNA in a clinical specimen via amplification of a specific target by PCR assay; OR

Demonstration of *C. burnetii* antigen in a clinical specimen by IHC, OR

Isolation of *C. burnetii* from a clinical specimen by culture. (**NOTE:** hazard to laboratory workers).

**PROBABLE**
A person with clinically compatible criteria for chronic disease, who does not meet any of the laboratory criteria for chronic Q fever but has an antibody titer to *C. burnetii* phase I IgG antigen greater than 1:128 and less than 1:800 by IFA.

**Note: Samples from suspected chronic patients should be evaluated for IgG titers to both phase I and phase II antigens.**

# 3 LABORATORY TESTING SERVICES AVAILABLE

The Division of Public Health and Environmental Laboratories does not provide testing for QF.

# 4 PURPOSE OF SURVEILLANCE AND REPORTING AND REPORTING REQUIREMENTS

## A. Purpose of Surveillance and Reporting

- To identify cases and clusters of human illness that may be associated with a bioterrorist event.
- To determine whether the source of infection may be a major public health concern (e.g., contaminated food, infected livestock) and stop transmission from such a source.
- To identify where QF occurs in New Jersey.
- To focus preventive and control measures.

## B. Laboratory and Healthcare Provider Reporting Requirements

The New Jersey Administrative Code (NJAC 8:57-1.8) stipulates that laboratories report (by telephone, by confidential fax, or in writing) all cases of QF to the local health officer having jurisdiction over the locality in which the patient lives or, if unknown, to the health officer in whose jurisdiction the healthcare provider requesting the laboratory examination is located. The healthcare provider must report all cases of QF to the local health officer having jurisdiction over the locality in which the patient lives.

**NOTE: Because of the rarity and potential severity of QF, the New Jersey Department of Health and Senior Services (NJDHSS) requests that information about any suspect or known case of QF, or any suspected exposure to *C. burnetii* that may be bioterrorist in nature, be immediately reported to the local health officer where diagnosed. If this is not possible, call the NJDHSS Infectious and Zoonotic Diseases Program (IZDP) at 609.588.7500 during business hours; 609.392.2020 after business hours and on weekends and holidays. Such telephone report shall be followed up by a written or electronic report within 24 hours of the initial report.**

## C. Local Health Officer Reporting Requirements

NJAC 8:57-1.8 stipulates that each local health officer must report the occurrence of any case of QF as defined by the case definition in section 2A above. A report can be filed electronically over the Internet using the confidential and secure Communicable Disease Reporting and Surveillance System (CDRSS).

## A. Laboratory Reports

1. If the LHD receives the lab or provider report, the LHD should investigate the case by contacting the patient or a family member or the healthcare provider and enter the information into CDRSS as instructed below.

2. If the lab or provider report is received by NJDHSS and includes the patient's address, the report will be entered into CDRSS and not mailed to the LHD.

3. If the lab or provider report received by NJDHSS does not include the patient's address, the report will be returned to the sending laboratory or healthcare provider or they will be telephoned to obtain a complete address. Once it is received, the report will be entered into CDRSS as "PENDING."

## B. Entry into CDRSS

The mandatory fields in CDRSS include: disease, last name, county, municipality, gender, race, ethnicity, case status, report status.

The following table can be used as a quick reference guide to determine which CDRSS fields need to be completed for accurate and complete reporting of QF cases. The "Tab" column includes the tabs which appear along the top of the CDRSS screen. The "Required Information" column provides detailed explanations of what data should be entered.

| CDRSS Screen | Required Information |
|---|---|
| **Patient Info** | Enter the disease name ("Q FEVER"), acute or chronic subgroup, patient demographic information, illness onset date, and the date the case was reported to the local health department (LHD). |

| CDRSS Screen | Required Information |
|---|---|
| **Addresses** | Enter any alternate address (e.g., a farm or agricultural business). Use the Comments section in this screen to record any pertinent information about the alternate address. Entering an alternate address will allow other disease investigators access to the case if the alternate address falls within their jurisdiction. |
| **Clinical Status** | Enter any treatment that the patient received and record the names of the medical facilities and physician(s) involved in the patient's care. If the patient received care from two or more hospitals, be sure that all are entered so the case can be accessed by all infection control professionals (ICPs) covering these facilities. If immunization status is known, it should also be entered here. If the patient died, date of death should be recorded under the Mortality section. |
| **Signs/Symptoms** | Check appropriate boxes for signs and symptoms and indicate their onset. Make every effort to get complete information by interviewing the physician, family members, ICP, or others who might have knowledge of the patient's illness. Also, information regarding the resolution of signs and symptoms should be entered. |
| **Risk Factors** | Enter complete information about risk factors to facilitate study of QF in New Jersey, using the approximate incubation period range for QF (two to three weeks). Ask the case-patient about any animal contacts (farm visits), occupation (e.g., farmer, laboratory worker), consumption of raw milk or unpasteurized milk products, or tick bites. |
| **Laboratory Eval** | Enter appropriate lab and diagnostic tests. Select microorganism identified if a culture was performed. Record specimen type as appropriate. Antimicrobial susceptibility testing results should be documented in the Comments section. Select *Coxiella burnetii* antibody if a serology test was performed. Record titer in "Value" field. **NOTE:** Review case definition for acute and chronic QF to determine significance of serologic testing; single titers of < 1:128 would not meet case definition for an acute case. |
| **Contact Tracing** | Confirm that the laboratory where the culture was identified exercised the proper precaution when working with the bacteria. Infectious aerosols can occur when manipulation of the isolate is done outside of a biosafety hood. Information regarding contacts with the case patient is not required for this disease. |

| CDRSS Screen | Required Information |
|---|---|
| **Case Comments** | Enter general comments (i.e., information that is not discretely captured by a specific topic screen or drop-down menu) in the Comments section. **NOTE:** Select pieces of information entered in the Comments section CANNOT be automatically exported when generating reports. Therefore, whenever possible, record information about the case in the fields that have been designated to capture this information; information included in these fields CAN be automatically exported when generating reports. |
| **Epidemiology** | Under the Other Control Measures section, indicate if the patient falls into any of the categories listed under Patient Role(s)/Function(s). Record name of and contact information for case investigators from other agencies (e.g., CDC, out-of-state health departments). Document communication between investigators in the Comments section. |
| **Case Classification Report Status** | Case status options are: "REPORT UNDER INVESTIGATION (RUI)," "CONFIRMED," "PROBABLE," "POSSIBLE," and "NOT A CASE."<br>• All cases entered by laboratories (including LabCorp electronic submissions) should be assigned a case status of "REPORT UNDER INVESTIGATION (RUI)."<br>• Cases still under investigation by the LHD should be assigned a case status of "REPORT UNDER INVESTIGATION (RUI)."<br>• Upon completion of the investigation, the LHD should assign a case status on the basis of the case definition. "CONFIRMED," "PROBABLE", and "NOT A CASE" are the only appropriate options for classifying a case of QF (see section 2A).<br>Report status options are: "PENDING," "LHD OPEN," "LHD REVIEW," "LHD CLOSED," "DELETE," "REOPENED," "DHSS OPEN," "DHSS REVIEW," and "DHSS APPROVED."<br>• Cases reported by laboratories (including LabCorp electronic submissions) should be assigned a report status of "PENDING."<br>• Once the LHD begins investigating a case, the report status should be changed to "LHD OPEN."<br>• The "LHD REVIEW" option can be used if the LHD has a person who reviews the case before it is closed (e.g., health |

| CDRSS Screen | Required Information |
|---|---|
| | officer or director of nursing).<br>• Once the LHD investigation is complete and all the data are entered into CDRSS, the LHD should change the report status to "LHD CLOSED."<br>• "LHD CLOSED" cases will be reviewed by DHSS and be assigned one of the DHSS-specific report status categories. If additional information is needed on a particular case, the report status will be changed to "REOPENED" and the LHD will be notified by e-mail. Cases that are "DHSS APPROVED" cannot be edited by LHD staff (see section C below).<br>If a case is inappropriately entered the case should be assigned a report status of "DELETE." A report status of "DELETE" should NOT be used if a reported case of QF simply does not meet case definition. Rather, it should be assigned the appropriate case status, as described above. |

## C. Other Reporting/Investigation Issues

1. It is not always possible to obtain all the information necessary to determine the case status of a patient. A minimum of three attempts (not necessarily to the same person, not at the same time during the day, and only one attempt through a letter/form by mail) should be made to obtain necessary information. If at this time information is not acquired, the case should be entered into CDRSS with as much information as is known, with attempts (dates and results of attempts) documented in the "COMMENTS" section and the case status changed to "NOT A CASE" and report status to "LHD CLOSED."

2. Every effort should be made to complete the investigation within three months of opening a case. Cases that remain open for three months or more and have no investigation or update notes will be closed by NJDHSS and marked as "NOT A CASE."

3. Once an LHD completes its investigation and assigns a report status of "LHD CLOSED," NJDHSS will review the case, and when it is complete will change the report status to "DHSS APPROVED." At this time, the case will be locked for editing. If additional information is received after a case has been placed in "DHSS APPROVED," an LHD will need to contact NJDHSS to reopen the case. This should be done only if the additional information changes the case status of the report.

4. An epidemiologic investigation to identify the source of infection should be initiated by the local health officer. Specifically, focus on the period beginning about two weeks before onset of disease date back to approximately three weeks before onset for the following exposures:

- Animal contact: Ask the patient about potential direct or indirect residential, or recreational exposure to cattle, sheep and goats.
- Food consumption: Ask the patient about the consumption of raw milk and unpasteurized soft cheeses.
- Occupational: Ask the patient if they work on a farm or in a bacteriologic laboratory.
- Travel history: Determine the date(s) and geographic area(s) outside North America visited by the patient.
- Include any additional comments regarding the case in the "Comments" section.

5. Institution of disease control measures is an integral part of case investigation. It is the local health officer's responsibility to understand and, if necessary, institute the control guidelines listed in section 6, Controlling Further Spread.

# 5 CONTROLLING FURTHER SPREAD

## A. Isolation and Quarantine Requirements (NJAC 8:57-1.10)

None.

## B. Protection of Contacts of a Case

There is no immunization or prophylaxis for contacts of cases.

## C. Managing Special Situations

### 1. Reported Incidence is Higher than Usual/Outbreak Suspected

If more than one case of QF is reported or suspected in a city or town, or if an outbreak is suspected, NJDHSS IZDP should be notified immediately at 609.588.7500. IZDP staff will help to investigate to determine the source of infection and mode of transmission. A common vehicle, such as infected animals or unpasteurized milk products, should be sought and applicable preventive or control measures should be instituted (e.g., removing implicated items from the environment). IZDP staff can also help determine a course of action to prevent further cases and can perform surveillance for cases that may cross several jurisdictions and therefore be difficult to identify at a local level.

**NOTE: If a bioterrorist event is suspected, NJDHSS and other response authorities will work closely with local boards of health and provide instructions/information on how to proceed.**

### 2. Exposure of a Laboratory Worker

Laboratory workers exposed to *C. burnetii* (e.g., did not use the protection of a laminar air flow/biosafety hood) should be observed for symptoms and treated if they become ill. Consult with NJDHSS IZDP at 609.588.7500.

## D. Preventive Measures

### 1. Environmental Measures

Implicated food items must be removed from the environment. A decision about testing implicated food items can be made in consultation with IZDP and the Food and Drug Safety Program (FDSP). FDSP can help coordinate pickup and testing of food samples. If a commercial product is suspected, FDSP will coordinate follow-up with relevant outside agencies (e.g., Food and Drug Administration, U.S. Department of Agriculture). FDSP can be reached at 609.588.3123.

**NOTE: The role of FDSP is to provide policy and technical assistance with the environmental investigation such as interpreting the New Jersey Food Code, conducting a hazardous analysis and critical control points risk assessment, initiating enforcement actions, and collecting food samples.**

### 2. Preventive Measures/Education

To prevent future exposures, advise the following:

- Educate the public on sources of infection.
- Educate workers at occupational risk (such as farmers, slaughterhouse workers, or laboratory workers) about the symptoms of the disease, how it is spread, and the risks of handling infected animal carcasses and products. They should know the proper way to reduce exposure, such as ventilating slaughterhouses or handling laboratory specimens carefully.
- Advise the public to not consume raw (unpasteurized) milk or milk products.
- Educate anyone who handles or disposes of placentas, fetuses, and/or discharges from facilities housing goats and sheep to use care and disinfect contaminated areas.
- Restrict access to barns and laboratories used in housing potentially infected animals.
- Vaccinate (where possible) individuals engaged in research with pregnant sheep or live *C. burnetii.* A vaccine for QF has been developed; however, this vaccine is not currently commercially available in the United States.
- Counsel persons at highest risk for developing chronic QF, especially persons with preexisting cardiac valvular disease or individuals with vascular grafts.

# Additional Information

A Q fever Fact Sheet is available at the NJDHSS Web site at http://www.state.nj.us/health/cd/index.html. Click on the “Topics A to Z” and scroll down to the subject Q fever.

There is no formal Centers for Disease Control and Prevention (CDC) surveillance case definition for QF. CDC case definitions are used by state health departments and CDC to maintain uniform standards for national reporting. For reporting a case to NJDHSS, always refer to the criteria in section 2A.

## References

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